Appl. No. 09/511,408
Amdt. dated July 7, 2004
Amendment under 37 CFR 1.116
Expedited Procedure Examining Group 2612

PATENT

REMARKS/ARGUMENTS

The pending claims stand finally rejected based on previously cited prior art after the Applicants had evidently addressed and overcome the prior art previously cited and applied by the Examiner. The Applicants wish to address the evident new grounds of rejection presented in the extensive (ten page long) Final Office Action and therefore respectfully request entry of this response and full consideration of the arguments and any amendments made to the claims. The fairness due the Applicants for further full consideration should be self evident, particularly in view of the following remarks.

Claims 1-10, as previously amended, and which overcame previously cited art, now stand finally rejected under 35 U.S.C. 103(a) over U.S. Patent No. 5,712,682 to Hannah in view of alleged admissions by the Applicants in the specification as to the state of the art. The Applicants submit that the primary cited reference is deficient and further that any purported admission of prior art does not cure the deficiencies.

Hannah had been cited previously but not applied for the teaching of the use of image regions for correction. As to claims 1-3 and 5, Hannah has now been cited for disclosing substantially all of the claimed invention except the use of individual units of raw colors of the pixels, with each one of the pixels being formed from a set of predetermined units of colors and each unit of color having an analog value representing luminance information, the luminance information being discrete on a time axis.

The Applicants note that the Examiner interpreted a statement in Hannah asserting that it could be used with any type of image sensor as generally applicable and therefore concluded that the use of "an image sensing element outputting individual units of raw colors of said pixels, each one the said pixels each being formed from a set of predetermined units of colors and each unit of color having an analog value representing luminance information, the luminance information being discrete on a time axis.

The reference to the Admitted Prior Art is the following paragraph at page one of the present Specification [translated for Japanese]:

"In this arrangement [digital still cameras that employ an arrangement for sensing a color image using a color filter on one image sensing device] an analog image signal is obtained from the image sensing device, in which a color image is represented by assigning predetermined colors to a number of pixels in advance, and pieces of luminance information with analog values representing the luminances of the pixels are discrete on the time axis."

The Applicants submit that the Hannah reference contains no description whatsoever on white balance processing required by an image sensor with a color filter. The referral to use of "any type of sensor" is inadequate, since it lacks any guidance as to why a particular type of sensing regimen might be preferred or what the outcome would be. Thus it would not direct one of skill in the art to solve the problem that has been addressed and solved by the present invention.

In the Hannah art, Figure 5 and Figures 6A, 6B and 6C, referred to by the Examiner, have been misinterpreted. The Examiner cited these figures for showing a technique wherein the bright regions of an object in the image to be photographed are decreased in gain so as not to saturate in luminance while the dark regions are increased in order to reduce the noise, with the dynamic range of the sensor being utilized to the maximum. This is luminance compensation.

Luminance compensation is totally different from white balance processing, which is the subject of the claimed invention. The citation is inappropriate.

The present invention is directed to white balance processing in the presence of a brightness dynamic range that exceeds the luminance range of the sensors. It is an analog white balancing process involving the uniform gain processing of the entire image plane for every color in the image spectrum, not mere luminance range-type compression in the absence of chrominance information. A more careful review of the language of the claims will make the distinction evident. In the process according to the claimed invention, a constant gain is applied to each individual color signal in the sensor with a color filter, and then the white balance is tread. Significantly, the gain based on the brightness of the image locally is not changed locally at that time. Where the image spectrum is produced by RGB component colors, a set of RGB

color filters is used to separately set the gain of each of the colors, R, G, and B, but these gains are kept constant in the whole image plane. These features are not taught or suggested by the Hannah reference.

Hannah's deficiencies are not cured by the disclosure in either the so-called admitted prior art or by any other reference. The assertions made that the admitted prior art in any way addresses and overcomes the problem solved by subject invention are incorrect.

With reference to claims 2, 3, and 4, in each instance, the Examiner has confused the concept of luminance correction in the absence of color with the inventive white balance correction in a specific color region in a manner that all signals representing the colors are modified in such a way that white balance between the colors is preserved.

Claim 4 stands rejected as above and in additionally over US Patent 5,870,505 to Wober et al. Wober has been cited merely for teaching that the use of a first and second correction control section in order to adjust the luminance of a pixel would increase the quality of the output. In the Applicants' view, Wober merely teaches a method for appropriately adjusting the brightness of an object in the dark regions of an image when the image is compressed and saved using Discrete Cosine Transform (DCT) techniques or is decompressed and display. The relevance is lost on the Applicants, since those teachings do not address the problem of white balance as in the claimed invention. Nothing in Wober addresses the problem of adjustment of the gain of the analog signal and the adjustment of white balance. Moreover, it appears that Hannah and Wober are incompatible and when combined are inconsistent with the claimed invention:

+ The signal processing method of Column 4, lines 5-15 of Hannah is not consistent with having the brightness adjusted at decompression of the digitized and compressed digital image signal, as in Wober.

+ The brightness adjustment method described in detail at column 4, lines 32-47 of Hannah, is of processing applied to a digital image such that brightness is adjusted. There is no description whatsoever of processing of an analog signal obtained from the sensor and there is no description on the processing of the signal in any state where imaging is not performed.

9

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By contrast, the object of the present invention leads one to a quite different result than the objects of the prior art. Whereas the prior art may be attempting to preserve the recording of an image by adjusting brightness in dark regions, the present invention is directed to maintaining white balance among colors in an image's analog state by making adjustments to the individual colors (RGB) as the signal is read out of the sensor as time series data.

Claims 6-10 have been rejected under 35 U.S.C. 103(a) as against claim 1 and additionally over U.S. Patent 5,534,916 to Sakaguchi. Sakaguchi has been cited for teaching use of two-dimensional coordinates within the image to generate a correction amount, and for teaching that such is preferred in order to correct shading problems created by a lens. The Applicants first note that the solution offered by Sakaguchi creates a problem overcome by the present invention. Sakaguchi teaches a method wherein color correction and peripheral sensitivity correction are separate problems dealt with in separate processes.. The solution taught by Sakaguchi would not solve the problem addressed by the invention. Moreover, the solution offered by the present invention would deal with the problems identified by Sakaguchi more effectively than Sakaguchi. In the present invention, since the correction is performed on the analog signal, the correction of sensitivity differences of the RGB components and the correction of periphery sensitivity is handled simultaneously even before the signal is converted to digital form. Thus, no false contours or false colors are generated, as is the case when the periphery sensitivity correction is performed after digital conversion and only on brightness data.

The foregoing observations apply to the reasoning used to reject claims 6-10. It is respectfully maintained that the claims define patentable subject matter and that the Final Rejection should be withdrawn.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance and an action to that end is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,

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11